Title/Subject: Electrical Safety Division Standard Application Procedure - Application Procedures For Evaluation of Mine-Wide Monitoring Systems, Barrier Classifications, and Sensor Classifications		
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Electrical Safety Division Standard Application Procedure - Application Procedures For Evaluation of Mine-Wide Monitoring Systems, Barrier Classifications, and Sensor Classifications

1 PURPOSE

This document specifies the documentation, equipment, and components necessary for the Mine Safety and Health Administration (MSHA) to evaluate an application for evaluation of mine-wide monitoring systems, barrier classifications, and sensor classifications.

2 SCOPE

This Standard Application Procedure (SAP) applies to all applications submitted to the Approval and Certification Center (A&CC) for evaluation of mine-wide monitoring systems, barrier classifications, and sensor classifications.

3 REFERENCES

MSHA Program Circular PC-4003-0, "Application Procedures For Evaluation of Mine-Wide Monitoring Systems, Barrier Classifications, and Sensor Classifications."

4 DEFINITIONS

4.1 "Classified" means an MSHA acceptance under the Mine-Wide Monitoring System Program that applies to barriers and sensors.

4.2 "Data transmission line" means the metallic cable located only above ground or in intake air and interfacing outstations with the central control area.

4.3 "Evaluation" means an MSHA acceptance that applies to mine-wide monitoring systems.

4.4 "Letter barrier" means an approved or classified device that limits voltage and current from its protected side and that bears the appropriate MSHA acceptance marking.

4.5 "Outstation" means the circuitry located above ground, or in intake air, which interfaces sensors with the central control area.

4.6 "Power circuit (P.C.) barrier" means a classified device that limits the voltage from its protected side and that bears the appropriate MSHA acceptance marking.

4.7 "Sensor" means a device providing a sensing or control function and bearing the appropriate MSHA acceptance marking classified.

5 GENERAL

The Mine Safety and Health Administration's Approval and Certification Center accepts applications for Mine-Wide Monitoring System (MWMS) Evaluations and Sensor Classifications and Barrier Classifications. This package contains application forms and instructions for the evaluation of MWMS, and for sensor and barrier classification for use on MWMSs. These evaluations or classifications are not applicable for use on other systems, approvals, acceptances or investigations. These application instructions are intended to provide a simple procedure whereby complex systems with performance specifications within recognized limits for safety can be expeditiously processed.

For further information, contact the Chief, Intrinsic Safety and Instrumentation Branch, at 304-547-0400.

6 APPLICATION INSTRUCTIONS FOR MINE WIDE MONITORING SYSTEM EVALUATION

An application letter for a Mine Wide Monitoring System Evaluation should contain the following information:

6.1 The company name, address, telephone number and the name of the company representative.

6.2 A company assigned code number - an arbitrary six-digit numerical code assigned by the submitting company for company identification purposes.

6.3 The date.

6.4 The functional block diagram and/or specification(s) of the Mine Wide Monitoring System including drawing number(s) and revisions. The functional block diagram should contain the necessary interconnection information to insure compliance with the conditions as outlined on the MWMS drawing(s) and specification(s) requirements.

6.5 The installation and maintenance - inspection manual used by the installer and maintained at the installation site, to insure that each MWMS is installed and maintained according to the conditions stipulated in the application. As a minimum, the installation and maintenance inspection manual should contain the following information:

6.5.1 Form Number/Date.

6.5.2 Characteristics to be inspected and/or tested, with limits.

6.5.3 Method of testing or inspection.

6.5.4 Results of testing or inspection.

6.5.5 Signature/Date.

6.6 Sign the application letter.

7 DRAWING AND SPECIFICATION REQUIREMENTS FOR USE OF SIMPLIFIED PROCESSING PROCEDURES

Drawing(s) and specifications submitted for a Mine Wide Monitoring System should show that:

7.1 All interfaces to any data transmission line contain circuitry limiting the Data Transmission Line voltage to a maximum of 60 volts per conductor to ground.

7.2 All outstations are either blue or red in color and are located in intake air.

7.2.1 Blue outstations may monitor sensors located in areas where equipment is required to be permissible.

7.2.2 Red outstations are <u>not</u> connected to any circuits entering or located within areas where equipment is required to be permissible.

7.3 All blue outstations have MSHA power circuit (P.C.) classified input barriers installed in the data transmission line and that the barrier voltage classification is greater than or equal to the highest power circuit voltage being monitored.

7.4 All blue outstation inputs from power circuits or sensors requiring external power for operation have an MSHA classified power circuit (P.C.) barrier whose voltage classification is greater than or equal to the maximum voltage of the circuit monitored, or supplied to the barrier, or being supplied to the sensor for operation.

7.5 All outputs of power circuit (P.C.) barriers (inputs to blue outstations) are 120 volts or less.

7.6 All sensors in areas where equipment is required to be permissible have an MSHA classification label. (The classification label shall designate an alphabetical classification for the sensor and the label shall be attached to the sensor or, when necessary for inspection purposes, near the sensor. i.e., an oil level sensor label could be on the oil tank at the point of cable entry.)

7.7 Cables from MSHA classified sensors terminate in an MSHA classified barrier of the same classification. MSHA classified barriers are located at a blue outstation.

7.8 Cables from MSHA classified barriers that terminate in explosion-proof enclosures located in areas where equipment is required to be permissible, comply with the following conditions:

7.8.1 The modification of existing permissible electrical equipment and circuitry within the permissible electrical equipment shall be documented by the operator under an acceptable Field Modification Application.

7.8.2 Cable termination (data transmission line from a blue outstation) within MSHA certified enclosures are to a barrier with a classification that matches the classification of the barrier at the blue outstation. A P.C. barrier with a voltage rating greater than or equal to the voltage input to the enclosure is required when power circuits are monitored or power is obtained from within the MSHA certified enclosure.

7.8.3 All cables leaving an MSHA certified enclosure and terminating in a sensor must meet the following conditions:

7.8.3.1 The sensor has a classification label.

7.8.3.2 The cable is shielded and the shield grounded at the MSHA certified enclosure.

7.8.3.3 The sensor classification has the same letter classification as a barrier located within the MSHA certified enclosure and connected to each individual sensor cable. A barrier classification label shall be located on the exterior of the MSHA certified enclosure and near each and every barrier cable entrance.

7.8.3.4 Connections to the data transmission line shall be between the data transmission line classified barrier and the P.C. barrier when a P.C. barrier is required.

7.8.4 Physical isolation is provided within an MSHA certified enclosure by means of an insulated or grounded metallic shield around all barriers and cables.

7.9 All sensors whose cable passes through an area where

permissible equipment is required, have an MSHA classification label and interface with a blue outstation through an MSHA classified barrier of the same classification.

7.10 Barriers or barrier enclosures are attached to the blue outstation and are so labeled that barrier outputs identify the type of sensor to which the barrier cable is connected, i.e., CO Sensor, CH4 Sensor, Anemometer.

7.11 All cables entering blue outstations from the P.C. barriers and all cables connecting a classified barrier with a classified sensor, and all cables connecting the blue outstation with nonclassified sensors are shielded with the shield connected to ground at the outstation.

7.12 Grounding techniques for outstations and barriers are employed using no less capacity than a No. 12 AWG Wire.

7.13 All blue outstations shall contain an MSHA evaluation label with the conditions of use as specified by MSHA.

7.14 MWMS components and circuits (except under the conditions outlined in 7.15) underground automatically deenergize upon loss of mine ventilation. Manual deenergization from a centralized surface control area is acceptable. Manual reenergization of each individual underground outstation is required.

7.15 Fire detection circuits that monitor conveyor belts or conveyor belt entries meet the conditions specified by 30 CFR, Part 75-1103, including the capability to monitor for four hours upon loss of mine power. Exception: circuits shall deenergize either manually or automatically upon loss of mine ventilation, unless the power supply and circuits have been accepted by MSHA as intrinsically safe. Such circuits must be manually reenergized at each individual underground outstation.

7.16 Detailed installation and maintenance instructions are supplied to all purchasers or users of these systems, installation inspection checklists must be included.

7.17 Restrictions of use and modification of the system are explained to purchasers or users of these systems.

8 APPLICATION INSTRUCTIONS FOR BARRIERS (POWER CIRCUIT (P.C.) VOLTAGE OR ALPHABETICAL CLASSIFICATION)

Complete the application for barrier evaluation form (MSHA - 15) as follows:

8.1 Enter the company name and return address in the spaces provided. Include the name of the representative to be contacted if additional information is needed.

8.2 Enter the telephone number of the company representative, including area code, in the space designated "Telephone No.".

8.3 Enter the company assigned code number in the space designated "Company Assigned Code No." (Arbitrary six-digit numerical code assigned by the submitting company for company identification purposes.)

8.4 Enter the date in the space designated "Date."

8.5 Enter the manufacturer's descriptive name for the barrier in the space designated "Nomenclature."

8.6 Enter the name of the company that manufactures the barrier in the space designated "Manufacturer."

8.7 Enter the manufacturer's assigned part number or model number of the barrier in the space designated "Part/Model No."

8.8 Enter the barrier classification requested (See Table 1 for alphabetical classification or enter the Power Circuit P.C. Voltage classification requested) in the space designated "Class Requested."

8.9 Enter the highest voltage level (nominal plus tolerances) that will be available at the output terminals of the barrier in the space designated "Maximum Output Voltage."

8.10 Enter the highest current value (nominal plus tolerances) that will be available at the output terminals of the barrier in the space designated "Maximum Output Current."

8.11 Enter the barrier rated voltage. Barrier rated voltage shall meet or exceed 250 volts.

8.12 If applicable, enter the approval agency and the referenced published standard under which the device has been evaluated, in the space designated "Approval Agency." Applications referencing approval agencies should include a copy of the applicable standard, the address of the approval agency, and a copy of the test report.

8.13 Draw the electrical schematic of the basic barrier design in the space designated "Electrical Schematic or Drawing Reference(s)."

8.14 The statement shall be completed by having an authorized representative sign in the space labeled "Original Signature" and filling in the title and company name in the appropriate spaces on the application. The individual signing the application shall be an authorized representative of the company, who can bind the company to the conditions stipulated in the application letter.

8.15 The Barrier Classification Application Letter (MSHA - 15) shall be submitted for each type barrier being evaluated. If applicable, a copy of the test report of the approval agency which previously evaluated the subject barrier is to be submitted with the application letter. Any drawing or specification sheet being submitted as documentation for the barrier classification shall comply with the following:

8.15.1 All drawings(s) have a title block, a title, a number assigned, a date, and be legible.

8.15.2 Pencil or ink notations not appear on drawings being submitted for documentation.

8.15.3 Drawings show the date of the latest revision.

8.15.4 All drawings include a note "Do Not Change Without Approval of MSHA" which is included on all drawings reproduced by the applicant.

8.15.5 All drawings are in English.

8.15.6 All applications for barrier classification shall be submitted with a barrier. The barrier will be returned by MSHA upon completion of the investigation.

8.15.7

TABLE 1

CLASS	VOLTS (Output)	CURRENT (Max)	CAPACITANCE (Max)	INDUCTANCE (Max)
A	5V	3A	5 mF	100 uH
B	5v	1A	5 mF	1 mH
C	10v	3A	60 uF	100 uH
D	10v	1A	60 uF	1 mH
E	12V	3A	30 uF	100 uH
F	12V	1A	30 uF	1 mH
G	15V	1.25A	15 uF	300 uH
H	20V	0.7A	7 uF	1 mH
I	2OV/10V	0.7A/0.1A	1 uF	800 uH
J	25V	0.3A	3 uF	10 mH
K	30V	0.lA	1 uF	15 mH
L	18V	1.0A	10 uF	1 mH
Z	Sensor may be connected to any class barrier (non-electrically operated switching devices, thermocouples, or resistance temperature detectors).			

9 APPLICATION INSTRUCTIONS FOR SENSOR CLASSIFICATION

9.1 Complete the application for sensor evaluation form (MSHA-16) as follows:

9.1.1 Enter the company name and return address in the spaces provided. Include the name of the representative to be contacted if additional information is needed.

9.1.2 Enter the telephone number of the company representative, including area code, in the space designated "Telephone Number."

9.1.3 Enter the assigned company code number in the space designated "Company Assigned Code No." (Arbitrary six-digit numerical code assigned by the submitting company for company identification purposes.)

9.1.4 Enter the date in the space designated "Date."

9.1.5 An authorized representative of the company shall sign in the appropriate space labeled "Original Signature." The individual signing the application shall be an authorized representative of the company who can bind the company to the conditions stipulated in the application letter.

9.1.6 Enter the manufacturer's descriptive name for the sensor in the space designated "Nomenclature."

9.1.7 Enter the name of the company that manufactures the barrier in the space designated "Manufacturer."

9.1.8 Enter the manufacturer's assigned model number of the sensor in the space designated "Model No."

9.1.9 Enter the sensor classification(s) requested in the space designated "Class Requested."

Sensor classification(s) should be consistent with the specifications of the barrier classification(s) to which it will be connected. (See Table 1.)

9.1.10 Enter the total of all the capacitance (nominal values plus tolerances) contained in the sensor in the space designated "Maximum Total Capacitance." If the sensor has no capacitance, indicate with "N/A" or "None."

9.1.11 Enter the total of all the inductance (nominal values plus tolerances) contained in the sensor in the space designated "Maximum Total Inductance." If the sensor has no inductance, indicate with "N/A" or "None."

9.1.12 Enter the ohmic value of the lowest rated resistor (nominal value less tolerance) of the sensor circuitry in the space designated as "Minimum Resistor Ohmage."

9.1.13 Enter the wattage rating of the lowest wattage rated resistor (nominal value less tolerance) of the sensor circuitry in the space designated as "Minimum Resistor Wattage."

9.1.14 Enter a brief description of the basic sensor design (i.e., manufacturer's specifications, circuit design, internal components, etc.) in the space designated "Brief Description of Design." If electrical schematic, layout design, or parts lists are necessary, the drawing number(s) shall be referenced under the "Brief Description of Design."

9.1.15 The application letter shall be completed by having an authorized representative sign in the space provided for original signature and filling in the title and company name in the appropriate spaces. The individual signing the application shall be an authorized representative of the company who can bind the company to the conditions stipulated in

the application letter.

9.2 Complete the application for Active Chemical/Hot Filament/or MSHA Pre-Accepted Sensor evaluation form (MSHA-17) as follows:

9.2.1 Enter the company name and return address in the spaces provided. Include the name of the representative to be contacted if additional information is needed.

9.2.2 Enter the telephone number of the company representative, including area code, in the space designated "Telephone No."

9.2.3 Enter the assigned company code number in the space designated "Company Assigned Code No." (Arbitrary six-digit numerical code assigned by the submitting company for company identification purposes.)

9.2.4 Enter the date in the space designated "Date."

9.2.5 An authorized representative of the company shall sign the appropriate space labeled "Original Signature." The individual signing the application shall be an authorized representative of the company who can bind the company to the conditions stipulated in the application letter.

9.2.6 Enter the manufacturer's descriptive name for the sensor in the space designated "Nomenclature."

9.2.7 Enter the name of the company that manufactures the sensor in the space designated "Manufacturer."

9.2.8 Enter the manufacturer's assigned model number of the sensor in the space designated "Model No."

9.2.9 Enter the sensor classifications requested in

the space designated "Class Requested." Sensor classifications should be consistent with the specifications of the barrier classifications to which it will be connected. (See Table 1.)

9.2.10 Enter the total of all the capacitance (nominal values plus tolerances) contained in the sensor in the space designated "Maximum Total Capacitance." If the sensor has no capacitance, indicate with "N/A" or "None."

9.2.11 Enter the total of all the inductance (nominal values plus tolerances) contained in the sensor in the space designated "Maximum Total Inductance." If the sensor has no inductance, indicate with "N/A" or "None."

9.2.12 Enter the ohmic value of the lowest rated resistor (nominal value less tolerance) of the sensor circuitry in the space designated as "Minimum Resistor Ohmage."

9.2.13 Enter the wattage rating of the lowest wattage rated resistor (nominal value less tolerance) of the sensor circuitry in the space designated as "Minimum Resistor Wattage."

9.2.14 Enter the MSHA assigned investigation number (IA, MM, etc.) where the sensor was previously accepted by MSHA. If the sensor was not previously accepted by MSHA, enter "N/A" or "No" in the space designated previously evaluated.

9.2.15 Enter a brief description of the basic sensor design, i.e., manufacturer specifications, circuit design, internal components, etc. in the space designated "Brief Description of Design." If the sensor was previously evaluated, explain any modification to the previously evaluated design.

9.2.16 The application letter shall be completed by

having an authorized representative sign in the space provided for original signature and filling in the title and company name in the appropriate spaces. The individual signing the application shall be an authorized representative of the company who can bind the company to the conditions stipulated in the application letter.

9.3 The sensor evaluation application letter (MSHA-16 or MSHA-17) shall be submitted for each type sensor being evaluated. Any drawing being submitted as documentation for the sensor evaluation shall comply with the following:

9.3.1 All drawings have a title block, a title, a number assigned, a date, and be legible.

9.3.2 Pencil or ink notations not appear on drawings being submitted for documentation.

9.3.3 Drawings show the date of the latest revision.

9.3.4 All drawings include a note "Do not Change without Approval of MSHA" which is included on all drawings reproduced by the applicant.

9.3.5 All drawings are in English.

9.4 All applications for sensor classification must be submitted with a typical sensor. The sensor will be returned by MSHA upon completion of the investigation.

APPLICATION LETTER
Barrier Classification
for use on
Mine Wide Monitoring Systems

COMPANY NAME & ADDRESS

_____

Attn: _____

_____

_____

TELEPHONE NO._____

Chief, Approval and Certification Center
Industrial Park Boulevard
RR 1, Box 251
Triadelphia, West Virginia 26059

DATE _____

Company Assigned Code No._____

GENTLEMEN:

We are requesting an evaluation of a barrier to be used on Mine Wide Monitoring Systems.

BARRIER SPECIFICATIONS

1. Nomenclature _____
2. Manufacturer _____
3. Part/Model No. _____
4. Class Requested _____
5. Maximum Output Voltage _____
6. Maximum Output Current _____
7. Barrier Input Voltage Rating _____
8. Approval Agency _____

FOR MSHA USE ONLY

ELECTRICAL SCHEMATIC OR DRAWING REFERENCE(S):

I _____(Original Signature), _____(Title) attest that _____ (Company) will maintain signed inspection records traceable to each unit on which we affix a classification label, to insure that it meets all the safety requirements listed above.

APPLICATION LETTER
Sensor Classification
for use on
Mine Wide Monitoring Systems

COMPANY NAME & ADDRESS

_____

Attn: _____

_____

_____

TELEPHONE NO._____

Chief, Approval and Certification Center
Industrial Park Boulevard
RR 1, Box 251
Triadelphia, West Virginia 26059

DATE _____

Company Assigned Code No._____

GENTLEMEN:

We are requesting an evaluation of a Sensor Assembly to be used on Mine Wide Monitoring Systems.

I _____ (Original Signature), attest to the following:

1. No power source is connected to or within the sensor, except through the MSHA Classified Barrier.
2. Chemical or hot filament components do not exist in this sensor.
3. All motors are brushless type.
4. Light-emitting diodes are the only illuminating devices.

FOR MSHA USE ONLY

SENSOR SPECIFICATIONS

1. Nomenclature _____
2. Manufacturer _____
3. Model No. _____
4. Class Requested _____
5. Maximum Total Capacitance _____
6. Maximum Total Inductance _____
7. Minimum Resistor Ohmage _____
8. Minimum Resistor Wattage _____

BRIEF DESCRIPTION OF THE DESIGN: _____

_____

_____

_____

I _____(Original Signature), _____(Title) attest that _____ (Company) will maintain signed inspection records traceable to each unit on which we affix a classification label, to insure that it meets all the safety requirements listed above.

APPLICATION LETTER
Active Chemical/Hot Filament/or MSHA Pre-Accepted Sensor Classification for use on Mine Wide Monitoring Systems

COMPANY NAME & ADDRESS

Chief, Approval and Certification Center
Industrial Park Boulevard
RR 1, Box 251
Triadelphia, West Virginia 26059

_____

Attn: _____

_____

_____

TELEPHONE NO._____

DATE _____

Company Assigned Code No._____

GENTLEMEN:

We are requesting an evaluation of a Sensor Assembly to be used on Mine Wide Monitoring Systems.

I _____ (Original Signature), attest to the following:

1. No power source is connected to or within the sensor, except through the MSHA Classified Barrier.
2. All motors are brushless type.
3. Light-emitting diodes are the only illuminating devices.

SENSOR SPECIFICATIONS

FOR MSHA USE ONLY

1. Nomenclature _____
2. Manufacturer _____
3. Model No. _____
4. Class Requested _____
5. Maximum Total Capacitance _____
6. Maximum Total Inductance _____
7. Minimum Resistor Ohmage _____
8. Minimum Resistor Wattage _____
9. Previously Evaluated _____

BRIEF DESCRIPTION OF THE DESIGN: _____

_____

_____

I _____(Original Signature), _____(Title) attest that _____ (Company) will maintain signed inspection records traceable to each unit on which we affix a classification label, to insure that it meets all the safety requirements listed above.